

CPP

SETS & RELATIONS : SHEET - 5

Miscellaneous problems on sets & Relations

LEVEL-1

- Q.1 Suppose $A_1, A_2, A_3, \dots, A_{30}$ are thirty sets each having 5 elements and $B_1, B_2, \dots, B_n$ are n sets each with 3 elements. Let $\bigcup_{i=1}^{30} A_i = \bigcup_{j=1}^n B_j = S$ and each elements of S belongs to exactly 10 of the A_i 's and exactly 9 of the B_j 's. Then n is equal to
- (a) 15 (b) 3 (c) 45 (d) None of these

- Q.2 Which of the following statement is wrong.

$R \rightarrow$ is set of real Numbers.

$N \rightarrow$ is set of Natural Numbers.

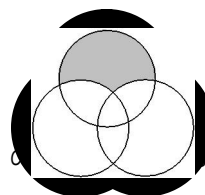
$Z \rightarrow$ is set of Integer.

$Q \rightarrow$ is set of Rational Numbers.

- (A) $N \subseteq R$ (B) $Q \subseteq R$ (C) $R \subseteq Q^c$ (D) $N \subseteq Z$

- Q.3 The shaded region in the given figure is

- (a) $A \cap (B \cup C)$ (b) $A \cup (B \cap C)$
(c) $A \cap (B - C)$ (d) $A - (B \cup C)$



- Q.4 If $A = \{1, 4\}, B = \{2, 3, 6\}$ and $C = \{2, 3, 7\}$, then verify that:

(i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$

(ii) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

- Q.5 If $A = \{2, 5\}$, form the set $A \times A \times A$.

- Q.6 Let A and B be two non-empty subsets of a set X such that A is not a subset of B , then

- (a) A is always a subset of the complement of B
(b) B is always a subset of A
(c) A and B are always disjoint
(d) A and the complement of B are always non-disjoint

- Q.7 In a certain town 25% families own a phone and 15% own a car, 65% families own neither a phone nor a car. 2000 families own both a car and a phone. Consider the following statements in this regard:

1. 10% families own both a car and a phone 2. 35% families own either a car or a phone
3. 40,000 families live in the town

Which of the above statements are correct

- (a) 1 and 2 (b) 1 and 3 (c) 2 and 3 (d) 1, 2 and 3

- Q.8 Statement-1: Maximum $n(A \cap B) = \text{Min}(n(A), n(B))$
 Statement-2 : if $A \subset B$ then $A \cap B = A$
 (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (C) Statement-1 is true, statement-2 is false.
 (D) Statement-1 is false, statement-2 is true.
- Q.9 Let U be the universal set and $A \cup B \cup C = U$. Then $\{(A - B) \cup (B - C) \cup (C - A)\}'$ is equal to
 (a) $A \cup B \cup C$ (b) $A \cup (B \cap C)$ (c) $A \cap B \cap C$ (d) $A \cap (B \cup C)$
- Q.10 State whether each of the following statements are true or false. If the statement is false, rewrite the given statement correctly.
- (i) If $P = \{m, n\}$ and $Q = \{n, m\}$, then $P \times Q = \{(m, n), (n, m)\}$
- (ii) If A and B are non-empty sets, then $A \times B$ is a non-empty set of ordered pairs (x, y) such that $x \in B$ and $y \in A$.
- (iii) If $A = \{1, 2\}$ and $B = \{3, 4\}$ then $A \times (B \cap \phi) = \phi$

LEVEL-2

- Q.1 In a survey of 25 students, it was found that 15 had taken Mathematics, 12 had taken Physics and 11 had taken Chemistry, 5 had taken Mathematics and Chemistry, 9 had taken Mathematics and Physics, 4 had taken Physics and Chemistry and 3 had taken all three subjects. Find the number of students that had (i) only Chemistry (ii) only Mathematics (iii) only Physics (iv) Physics and Chemistry but not Mathematics (v) Mathematics and Physics but not Chemistry (vi) only one of the subjects (vii) at least one of three subjects (viii) none of three subjects.
- Q.2 A college awarded 38 medals in Football, 15 in Basketball and 20 in Cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports?
- Q.3 A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like product B, what is the least number that must have liked both products?
- Q.4 Out of 500 car owners investigated, 400 owned car A and 200 owned car B, 50 owned both A and B cars. Is this data correct?
- Q.5 If D be a set which contains the elements which are in exactly 2 sets of the three sets A, B, C then $D =$
 (A) $A \cup B \cup C - (A \cap B \cap C)$ (B) $(A \cap B) \cup (B \cap C) \cup (C \cap A) - (A \cap B \cap C)$
 (C) $A \cup B \cup C$ (D) $(A \cap B) \cup (B \cap C) \cup (C \cap A)$
- Q.6 Show that if $A \subset B$, then $C - B \subset C - A$
- Q.7 Let A, B , and C be the sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Show that $B = C$.

ANSWERS - SHEET - 5

LEVEL - 1

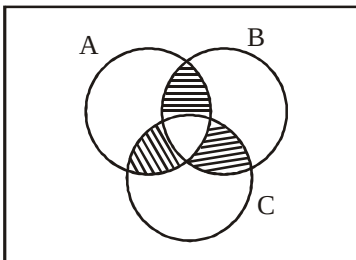
1. C
2. C
3. D
6. D
7. C
8. A

Number of common elements in 2 sets cannot be more then the number of elements in the smallest set.]

9. C
10. (i) False (ii) False (iii) True

LEVEL - 2

1. (i) 5 (ii) 4 (iii) 2
(iv) 1 (v) 6 (vi) 11 (vii) 23
2. 9
3. 170
4. incorrect
5. B



Only B converges to given venn diagram]